What is claimed is:

1.   A fiber optic sensor, comprising:

a test fiber having a first port and a second port;

a light source for producing a beam of light propagating along the test fiber;

a fiber optic beamsplitter having a first port connected to the light source, a second port connected to the first port of the test fiber, and a third and a fourth port;

a plurality of reflectors positioned along the test fiber and a plurality of loss-inducing members positioned along the test fiber, wherein said each of the reflectors is matched to each loss-inducing members, wherein at least one reflector is placed between each consecutive loss-inducing members;

an optical reflection detector for detecting a light flux, the optical reflection detector connected to the third port of optic beamsplitter, wherein the reflection detector is adapted to sense changes in the power of the light reflected from the reflectors;

an optical transmission detector adapted to receive the light flux, connected to the second port of test fiber, said transmission detector being operable to sense changes in the power of the light transmitted through the test fiber; and

a   transmission/reflection   analyzer   connected   to reflection and transmission detectors, said analyzer adapted

between transmitted and reflected powers for different locations of the disturbance along the test fiber.

2. The fiber optic sensor according to claim 1, wherein said plurality of reflectors comprises a set of lumped reflectors selected from the group consisting of fiber Bragg gratings and fiber splices.

3. The fiber optic sensor according to claim 1, wherein, said plurality of reflectors are continuously distributed inside the test fiber.

4. The fiber optic sensor according to claim 1, wherein said plurality of loss-induced members are continuosly distributed along the test fiber.

5. The fiber optic sensor according to claim 1, wherein said plurality of loss-inducing members comprises a plurality of bending members.

6. The fiber optic sensor according to claim 1, wherein said plurality of loss-inducing members comprises a plurality of waveguide-sensitive members.

7. The fiber optic sensor according to claim 1, further including a second light source connected to the second port of said test fiber through a second fiber optic beamsplitter, the second beamsplitter having a first port connected to said second light source, a second port connected to the second port of said test fiber, a third port connected to said optical transmission detector and a fourth port.

8. The fiber optic sensor according to claim 1, wherein a

to sense changes in the power of light source in order to avoid the influence of the light source power instability.

9. The fiber optic sensor according to claim 2, wherein said plurality of reflectors comprise a set of selective reflectors, each reflective at a non-overlapping different narrow bandwidth of wavelength inside a measurement wavelength range, and said light source having broadband radiation range which exceeds or equals to said measurement wavelength range.

10. The fiber optic sensor according to claim 5, wherein, said plurality of bending members includes an absorber/expander mechanically coupled to the test fiber to produce a change in transmission of light along the fiber upon absorption of a chemical agent.

11. The fiber optic sensor according to claim 7, wherein said transmission/reflection analyzer detects the value and identifies the location of the disturbance along the fiber by using an unique relation between transmitted and reflected powers for different locations of the disturbance along the test fiber for both light sources.

12. The fiber optic sensor according to claim 7, wherein a second normalizing optical detector is connected to the fourth port of said second fiber optic beamsplitter, said detector being adapted to sense changes in the power of second light source in order to avoid the influence of the second light source power instability.

13. The fiber optic sensor according to claim 9, wherein each selective reflectors from said set of selective

detector is a spectrum analyzer.

14. The fiber optic sensor according to claim 1, wherein transmission/reflection analyzer operates under the following algorithm:

$$X = T(N-k+1)/N$$

where X is a power of the reflected light decrease

   N is a number of lumped reflectors,

   T is a decrease in percent of the transmitted power

   K is an integer, which is defined by the position or number of the loss-inducing member that is disturbed.

15. A method for calculating the value and location of a disturbance in a system, the method comprising the steps of:

   A) positioning an optical fiber sensor along the system to be monitored;

   wherein the optical fiber sensor comprises:

   a test fiber having a first port and a second port;

   a light source for producing a beam of light propagating along the test fiber;

   a fiber optic beamsplitter having a first port connected to the light source, a second port connected to the first port of the test fiber, and a third and a fourth port;

   a plurality of reflectors positioned along the test fiber and a plurality of loss-inducing members positioned along the test fiber, wherein each of the reflectors is matched to each of the loss-inducing members, wherein at least one reflector is placed between each consecutive loss-inducing members;

   an optical reflection detector for detecting a light flux, the optical reflection detector connected to the third port of optic beamsplitter, wherein the reflection detector is adapted to sense changes in the power of the

transmission detector being operable to sense changes in the power of the light transmitted through the test fiber; and

a transmission/reflection analyzer connected to reflection and transmission detectors, said analyzer adapted to measure the value and identify the location of the disturbance along the test fiber by using an unique relation between transmitted and reflected powers for different locations of the disturbance along the test fiber

B) detecting a change in light transmission and reflection in said fiber; and

C) calculating the value and location of the disturbance by using an unique relation between between transmitted and reflected powers for different locations of the disturbance along the test fiber.